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## PLATE VI.

FIG. 4. Tongue, hyoid, trachea, heart, liver and digestive organs removed from their cavities and photographed on anterior or ventral view. The crop (cr.) has been turned around to occupy the posterior aspect of the windpipe or trachea, in order that the latter may be seen for its entire length. The cardiac extremities of the great vessels at the base of the heart can easily be recognized. The left lobe of the liver (ll.) and the gizzard are in the normal relations to each other.

FIG. 5. Same structures and organs as seen in Fig. 4. The tongue and pharynx are seen upon dorsal view; the crop and oesophagus are twisted about the trachea in order to show the reverse side of the first-mentioned organ. The lower part of the trachea (lower larynx) and bronchial tubes are seen. Heart and great vessels are shown upon posterior aspect. The left lobe of the liver is thrown forwards in order to give a complete view of the gizzard, which latter has been bisected and turned so as to show its dorsal surface.

FIG. 6. Interior aspect of the anterior moiety of the gizzard exhibiting the muscular portion, with the central cavity filled with small pebbles.

FIG. 7. Anterior view of the lower part of the trachea; the lower larynx, and the bronchial tubes. About twice natural size, and drawn by the author direct from the specimen.



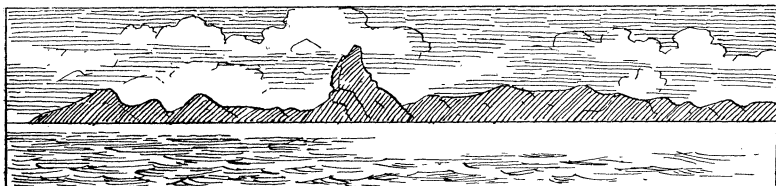
## TEN HOURS AT FERNANDO NORONHA.

A DAY'S COLLECTING ON THE SOUTH GEORGIA EXPEDITION OF  
THE BROOKLYN MUSEUM AND THE AMERICAN MUSEUM OF  
NATURAL HISTORY.

BY ROBERT CUSHMAN MURPHY.

ON October 15, 1912, the good whaling brig *Daisy* of New Bedford was running merrily across the trade wind just south of the equator. All day long, boobies and other passing sea birds told us that we were nearing land, and at nine in the evening we made out the twinkling, revolving light of an island lying under the bright quarter moon. We hauled aback our square sails and lay to for the night.

The bold, overhanging "Pyramid" of Fernando Noronha, a black, phonolite mountain which is the most conspicuous landmark in all the South Atlantic, loomed out about nine miles distant



in the following dawn. As we bore down toward the land in the hazy light, the long strip of rough hills, which had first seemed continuous, gradually broke up into the several islets of which the group is composed. The sun, leaping above the equatorial horizon, revealed a green lowland, well clothed with shrubs and small trees, and a higher zone of bare, weathered peaks. The four tall, skeleton "wireless" towers were probably the only features which had been added to the landscape since Charles Darwin in the *Beagle* visited this Brazilian penal settlement fourscore years ago.

Fernando Noronha lies in latitude  $3^{\circ} 50' S.$ , longitude  $32^{\circ} 25' W.$ , two hundred miles off the South American mainland from which it is divided by a channel 13,000 feet in depth. The rugged group is only about seven miles long, by one and a half in width. The component islets, portions of the crater rim of an ancient volcano, are of basaltic rocks, without sedimentary deposits, but with injected dykes of phonolite or "clinkstone," the whole now almost worn away by the action of the denuding tropical rainfall and the battering seas, although the famous, columnar Pyramid still rises to a height of 1,089 feet. Most of the smaller islets are bare of vegetation except for a few grasses and sedges, some thickets of a low shrub (*Phyllanthus*), and several leguminous vines. Parts of the main island are covered by a variety of stunted trees and shrubs, including an endemic fig (*Ficus noronhæ*) and a leguminous tree (*Erythrina*). There is a large percentage of widely distributed tropical weeds, and a remarkable number of plants having edible berries or seeds. Within the memory of man the leeward side of the land was heavily forested, but the larger trees have long since

been felled in order that the exiled convicts, practically the only human beings to share the sea-beaten spot with countless nesting ocean birds, might not build rafts and escape to the shores of Brazil.

When the *Daisy* had drawn within a couple of miles of the coast, whaleboats were lowered, and I went ashore along with a fishing party. On the way to the land we were surrounded by an enormous flock of Noddy Terns which stretched away to the far horizon until the birds appeared like tiny, swarming insects. Passing several conical inaccessible islets, on which Man-o'-war-birds were breeding, we entered a cove of grottoed rock ending in a crescent of sand. Behind the beach the fissured, yellow wall of a cliff, conforming with the semicircular outline of the cove, rose sheer to a height of four or five hundred feet, and clustering in thousands along its upper surface were graceful Noddies on their scaffold nests. Side by side on a twisted bough at the foot of the cliff sat two snow-white "Love Terns" (*Gygis*), antitheses of the black Noddies.

The cool water of the cove lured us to a swim, and, as several of us plunged in, the blurred image of a green turtle glided away before us, and a shoal of porpoises see-sawed leisurely across the inlet. One of the sailors fired his gun from the whale-boat at something or other (which he did not hit), and the roar reverberated from face to face of the curving wall, while a horde of screaming birds poured down off the rocks, adding to the bewildering echoes.

Other inhabitants than the birds were also disturbed by the report of the gun. When we turned toward the beach a tall, black, muscular fisherman, with a tattered seine over one shoulder, and wearing not a stitch of clothing, stood eyeing us curiously. Presently out of the shrubbery below the cliff came a fellow of lighter skin, clad in short canvas trousers and a blue tam-o'-shanter cap, with a crude wicker basket slung over his back. The pair might have passed for Robinson Crusoe and his man Friday on washday. The cap of the second native came off obsequiously when we landed, while both men extended a right hand of welcome and ingenuously explained in Portuguese that they were murderers serving sentences on the isle. The quadroon had been there fourteen years, and his durance was to terminate at the close of eight months more when he would return to his native Pernambuco.

He directed us to a better beach around the westward promontory, where he said he would meet us. Accordingly we pushed off shore, while the poor islander, taking a pair of goatskin sandals from his basket, painfully toiled up a stony, winding path across the ridge, leaving his comrade to cast the net alone.

After our whaleboat had rounded the point of rock there lay before us a charming bit of seashore. The broad beach of golden sand stretched in an even curve to another headland a mile beyond, and sloped gently into the sea which for a long distance from shore was wondrously transparent. The upper beach was a riot of vegetation, among which the tropical morning-glory, *Ipomæa pes-capræ*, and a slender-stalked cactus (*Cereus*) were conspicuous; and still beyond, a thicket of brush and trees, filled with fruit-eating doves (*Zenaida*), concealed the base of the precipice. The latter ran parallel to the water-line as far as the distant headland. Its lower face was covered with vines which clambered up the seams, and its crest was bordered with pink and orange-colored blossoms of small trees whose roots drooped over the edge. Sharp slabs of rock projected here and there, offering perfect nesting sites for the birds which appeared in hosts whichever way we turned. The chattering Noddies, of two species, were most abundant, but large-eyed *Gygis* terns, and satin-feathered Bo'sun Birds (*Phaëthon*), trailing their comet tails, were flying to and from the niches in the cliff; a flock of migrating plover pattered along the edge of the sea; and boobies and Man-o'-war-birds came wheeling in fearlessly from their feeding grounds off shore.

For the sea birds it is always springtime at Fernando Noronha, The year is divided into rainy and dry periods, January to July, July to December, respectively, but there is no fixed breeding season, and eggs and young can be found in every month of the twelve. For this reason the isle is a great center and source of avian population; even such maritime species as the bo'sun birds, which spend most of their lives in the remotest parts of the ocean, can here be seen in their cliff-built homes from the year's beginning to its end.

Our volunteer guide had removed his carefully fostered sandals on leaving the rough rock, and now awaited us on the beach. The *Daisy's* cooper and I joined him, the rest of the boat party rowing.

off to a reef to fish. The guide, who was informed of our mission, pointed out the nests of the various birds, and captured for us some of the small lizards which scurried over the sand and rock everywhere. He talked glibly in his Brazilian jargon, giving voluminous information concerning the severities inflicted upon the unfortunate exiles. We met a number of his equally unclad fellow prisoners, as well as several pitiful, rheumatic, illiterate boys, children of the convicts, who, like the adults, followed and assisted us for the sake of gathering our empty cartridge shells. Finally the Pernambucan took the cooper on a visit to some of the convicts' *casas*, miserable huts, half-thatched with cocoanut leaves and destitute of furniture. The women, some of them whites of unmixed blood, were almost as sparsely clothed and as woe-begone as the men.

During the absence of my companions I climbed a rough, nearly perpendicular footpath into the woods. Thorn-shrubs, trailing vines, and numerous berry-bearing plants among which the wild doves were feeding, made a fairly dense cover. The "Pinhao" or pink-flowered tree (*Jatropha gossypifolia*) which we had noted from the beach, was leafless although in full blossom, just as on the occasion of Darwin's visit in 1832. I ascended as far as possible up the bare, steep side of the Pyramid. Directly below me lay the long, picturesque beach, with the fleet-winged birds crossing and recrossing it. Not a trace of the work of human hands was in sight. Here was Prospero's isle, cooled by a tireless trade-wind — a land where fruit trees and melons flourish without cultivation, a land which might become a second Bermuda, yet for a hundred years it has been given up to wretched criminals under the callous régime of the Brazilian penal system.

When we joined our fishing party late in the afternoon we found the whaleboat well laden with various brightly-colored tropical fishes and several sharks. The latter had been a great nuisance to the fishermen all day, biting many of the smaller fishes from the hooks before they could be drawn to the surface, and nipping the larger ones clean in half.

As evening drew near we perceived the brig bearing down the coast toward us, and reluctantly we sailed off to join her, leaving the allurements and the misery of Fernando Noronha. At dusk we were running swiftly down the trade wind, the Pyramid behind us still showing faintly through a bluish haze.

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## A LIST OF THE BIRDS OF FERNANDO NORONHA.

1. **Oceanites oceanicus** (Kuhl). A few Wilson's Petrels were seen from the whaleboat between our vessel and the shore.
2. **Phaëthon lepturus** (Lacép. & Daudin). *Phaëthon lepturus*, Grant, Cat. B. XXVI, p. 453, Nicoll, *Ibis*, 1904, p. 39.

The Bo'sun Birds were nesting in niches of the cliffs along the beach, and they could be frightened from their eggs only with difficulty. Three breeding females, of which two are typical *lepturus*, were collected. The third specimen represents a phase of the species hitherto apparently undescribed. In this specimen the white feathers are replaced entirely by a plumage of pale pink, or pinkish salmon, slightly orange on the back but less so than in *P. fulvus* of the Indian Ocean. The pattern of light and dark

coloration differs a little from that of the two white birds in that the black on the outermost primary extends to within 23 mm. (.9 in.) of the tip, and on the third from the outermost primary to within 8 mm. of the tip. It differs moreover in its smaller dimensions and in having the culmen horn-colored instead of yellow. Further collection may possibly show that this pink *Phaëthon* is worthy of taxonomic distinction.

*Measurements of skins.*

	exp. culmen	tarsus	wing	tail
♀ (white)	48	22	265	403
♀ (white)	46.5	23	264	416
♀ (pink)	44	21.5	251	451
An unsexed specimen of <i>P. fulvus</i> in collection of Am. Mus. Nat. Hist.				
	49	23	283	530

3. ***Phaëthon æthereus*** (Linn.). *Phaëthon æthereus*, Sharpe, Journ. Linn. Soc. (Zoöl.) XX, 1890, p. 480. Grant, Cat. B. XXVI, p. 458.

4. ***Sula leucogaster*** (Bodd.). *Sula leucogastra*, Sharpe, Journ. Linn. Soc. (Zoöl.) XX, 1890, p. 480. *Sula fusca*, Ridley, Zoölogist, 1888, p. 43.

Boobies of this species were exceedingly abundant at the island. While we were passing to and from shore in the whaleboat, they flew about us closely, and three immature examples were collected.

5. ***Fregata aquila*** (Linn.). *Tachypetes aquila*, Sharpe, Journ. Linn. Soc. (Zoöl.) XX, 1890, p. 480. Mosely, Notes by a Naturalist on H. M. S. *Challenger*, p. 71.

We found the Frigate Bird abundant. Numbers were seen upon their nests about the summits of the smaller islets.

6. ***Charadrius dominicus*** (Müll.)?

A flock of seven plover, believed to have been of this species, were seen repeatedly along the shore of the inlets. Unlike the native birds these plover were very shy, and I could neither collect one nor approach the flock closely. Fernando Noronha is doubtless a regular station for migrating shore birds, and several of the authors cited above refer to *Limicolæ* at the island.



7. **Arenaria interpres** (Linn.). *Strepsilas interpres*, Nicoll, Ibis, 1904, p. 39.

8. **Sterna fuliginosa** (Gm.). *Sterna fuliginosa*, Nicoll, Ibis, 1904, p. 39.

9. **Anous stolidus** (Linn.). *Anous stolidus*, Saunders, Cat. B. XXV, p. 141. Nicoll, Ibis, 1904, p. 38.

10. **Micranous leucocapillus** (Gould). *Anous melanogenys*, Sharpe, Journ. Linn. Soc. (Zööl.) XX, 1890, p. 479.

At the time of our visit Noddies of this species far outnumbered all other birds. Six breeding adults were collected. Several are in new, unworn plumage, and have the outermost remex only half grown or less.

*Measurements of 5 skins.*

	exp. culmen	tarsus	wing	tail
♂	46	23	217	122
♂	47	23	222	117
♂	44	23	222	116
♂	43	22.5	225	118
♀	44	23	218	113

11. **Gygis crawfordi** Nicoll. *Gygis candida*, Sharpe, Journ. Linn. Soc. (Zööl.) XX, 1890, p. 480. Saunders, Cat. B., XXV, p. 149. *Gygis crawfordi*, Nicoll, Bull. B. O. C., XVI, 1906, p. 102.

Nicoll, Ibis, 1909, p. 669, states, "Probably all examples of the White Tern from the Atlantic are referable to this species, as a glance at the map will show how completely it is isolated. A few pairs breed on Fernando Noronha Island, and it has been also recorded from St. Helena and Ascension as a breeding species."

About twenty examples of this tern were seen, mostly flying in pairs from shelf to shelf of the upper cliffs, or sitting side by side on the boughs of trees. Four breeding birds were collected, one of which was preserved as a skeleton. They agree in general with Nicoll's description, which, however, is not very detailed: — "Similar to *G. candida*, but may be easily distinguished by the following characters. Bill *wholly* black (not *blue* at the base, as in *G. candida*), more slender and narrower at the base; nostril situated much nearer the forehead; wing longer than in *G. candida*; tarsi and toes pale blue, webs white." The species appears also to differ from *G. alba* (= *candida*) in having a heavier ring of black around the eye.

*Measurements of skins.*

	exp. culmen	tip of bill to nostril	gonys	tarsus	wing	tail
♂	40	27	24.5	14	240	103
♀	41	29	25	15	240	113
♀	41	29	25	14.5	241	115
♀ of <i>G. alba</i> from Japan.	37	26	21.5	14	220	102

The length in inches of the entire culmen of the ♂ from Fernando Noronha is only 1.8 as against "2.1" for the type specimen of *Gygis crawfordi* from Trinidad Islet.

In one ♀ of the Fernando Noronha birds the shafts of the primaries are white; the other two birds have the shafts marked with brownish pigment.

It is interesting to note that this white-feathered bird has a heavily pigmented, coal-black skin, whereas the skin of the black tern, *Micranous*, is white in every part. The dermal melanin of *Gygis* doubtless bears the same relation to the absorption of external heat, or the prevention of radiation of bodily heat, as the black plumage of *Micranous*.

12. ***Zenaida auriculata*** (Temm.). *Zenaida noronha*, Gray, List B. Brit. Mus., 1856, Columbæ, p. 47. *Zenaida maculata*, Sharpe, Proc. Linn. Soc. (Zool.) XX, 1890, p. 479. *Zenaida auriculata*, Salvadori, Cat. B., XXI, p. 384. *Peristera geoffroyi*, Mosely, Notes by a Naturalist, p. 71.

This species is the most abundant land bird at Fernando Noronha. According to Moseley the doves sometimes breed on the ledges with Boobies and Noddies, the nests being intermingled with those of the seabirds.

Of three specimens collected a ♂ and a ♀ were breeding.

*Measurements of skins.*

	exp. culmen	tarsus	wing	tail
♂	17	25	134	73
♂	17	24	135	80
♀	16.5	24.5	134	76

These figures confirm the statements of Sharpe, l. c., and of Salvadori, Cat. B., XXI, p. 386, that the dimensions of Fernando

Noronha specimens of *Z. auriculata* are somewhat less than those of birds from the South American continent. Probably the form is worthy of subspecific distinction, for according to the astronomer Halley "Turtle Doves" were abundant at Fernando Noronha at the time of his visit in February 1699.

My specimens show three stages of the moult, the sequence of which seems to be as follows:—The inner primaries and central rectrices are first moulted; after the replacement of these by new feathers the remaining quills are lost, primaries 10 and 9 being the last to drop out. The moult of the contour feathers follows that of the quills.

The female dove in the collection is as brightly colored as a male in new plumage.

13. ***Elainea ridleyana*** Sharpe. *Elainea ridleyana*, Sharpe, Proc. Zool. Soc., 1888, p. 107.

This flycatcher and the following species of *Vireosylva* are endemic.

14. ***Vireosylva gracilirostris*** (Sharpe). *Vireo gracilirostris* Sharpe, Journ. Linn. Soc. (Zool.) XX, 1890, p. 478.

Many of these greenlets were seen in the fig trees and in the thickets near the beach. A ♂ and a ♀, both breeding birds, were collected. Both were in fresh plumage, some of the body feathers not having lost the sheaths, while the quill feathers show only the slightest signs of wear. The contour feathers of the back measure up to 35 mm. in length.

*Measurements of skins.*

	exp. culmen	tarsus	wing	tail
♂	16	20.5	64	50
♀	15	21	66	55

In addition to the fourteen species listed above, references are made in several of the works which I have cited to the following birds:—"small plover," "bird resembling a Yellowshank," "sandpiper," "curlew," and "a small species of Albatross."